

Annual Project Summary

St. Louis, Missouri Area Surficial Materials Database

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James R. Palmer

Missouri Department of Natural Resources
Geological Survey and Resource Assessment Division
Box 250, Rolla, Missouri 65402-0250

Telephone (573) 368-2182 Fax (573) 368-2111 jim.palmer@dnr.mo.gov email

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Technical Abstract

This project will develop and populate a geologic and geotechnical database of surficial materials in the St. Louis, Missouri area for use in earthquake hazard evaluation. Existing geotechnical boring and well log data for the database have been solicited from public and private sources. Currently no such surficial materials database exists for the St. Louis, Missouri area. The St. Louis urban area (Figure 1 and 1A) is one of two regions that are the focus of the USGS Earthquake Hazard Program Five-Year Science Plan in the Central and Eastern United States. This database is the first step needed in the process to develop derivative surficial materials and earthquake soil amplification maps. The data will also be made available to the public.

A large amount of boring records and data are available from three public sources. To date we have obtained permission to copy records that are in the United States Army Corp of Engineers (USACE) St. Louis District and Kansas City District offices. In both USACE districts we have worked through Freedom of Information Act officers. The St. Louis Metropolitan Sewer District has an open record policy and has offered complete access to all data and drawings including assistance in obtaining coordinates for their project borings. We have begun copying boring logs and data from the Missouri Department of Transportation (MODOT). All three data sources have at least some records with site maps that can be used to derive geographic coordinates suitable for entering into a spatial database. Our current efforts are focused on MODOT records that have spatial data available that ties the borings to the coordinates of bridge or culverts. The large number of borings that are in the MODOT files may occupy all of our time this year. To date logs and data have been obtained logs 552 MODOT structures or projects. Figure 1B, shows locations that have copied logs and data that have been entered into the database. Sites that have standard penetration test data are shown on Figure 1C, and cone penetrometer and seismic cone penetrometer data are shown on Figure 1D.

Non-Technical Summary

This project will develop a soil materials database of the St. Louis, Missouri area to map earthquake hazards. The data are from the existing records of public and private sources. This database is the first step needed to develop maps that show potential shaking and liquefaction hazards. The database will be similar to but more areally extensive and comprehensive than the database developed for producing earthquake hazard maps during the USGS Memphis urban seismic hazard mapping project. Data entered into this database will be made available to the public for planning and mapping purposes.

Results

To date logs have been obtained for records for 552 MODOT structures or sites (Figure 1B). Logs and geotechnical data from 122 of these have been entered into a series of MicroSoft Access tables. In this first year of a proposed two-year project, efforts have focused on this large, comprehensive dataset available from the MODOT, that includes soil material lab data and field data that are not generally available from other public or private sources in the region. The table entries include (where available): materials description, grain size, physical properties, water observations, core log, and dynamic properties (see Figure 2 for an example). MODOT Soils and Geology log data all have field materials descriptions. Where available logs also have standard penetration data, Pocket Penetrometer, Torvane, unconfined compressive strength, grain size, liquid limits, plasticity index, ASTM soils class, shearwave velocity, shear modulus and damping, and core descriptions.

Reports Published

No reports have been published.

Data Availability

The records collected for this study includes scanned logs, in Acrobat *.pdf format and data from the logs entered into a series of tables. These scanned records and the database may be obtained by contacting James Palmer at the Missouri Department of Natural Resources, Geological Survey and Resource Assessment Division at the above phone number, email or postal address.

Figure 2. An example of an entry table screen used for the St. Louis Surficial Materials Database. The example below is for dynamic soil properties lab data or field data.

MoDOT BOREHOLE AND GEOPHYSICAL DATA - [dynamic soil properties]

File Edit View Insert Format Records Tools Window Help

STOP

DYNAMIC SOIL PROPERTIES

BOREHOLE OR SITE IDENTIFICATION

Structure ID:

English or metric:

Borehole or site ID:

Borehole or site elev (ft):

Borehole or site elev (m):

UTM X coordinate:

UTM Y coordinate:

SAMPLE DEPTH AND ELEVATION

Sample Depth (ft): Sample elev (ft):

Sample Depth (m): Sample elev (m):

FIELD GEOPHYSICS

Type of shear wave velocity test:

Receiver Borehole Id 1:

Receiver Borehole Id 2:

shear wave velocity (ft/s):

shear wave velocity (m/s):

LABORATORY DYNAMIC PROPERTIES

Type of Low Strain Test:

Gmax (kips/sq ft): Gmax (kN/sq m): Dmax:

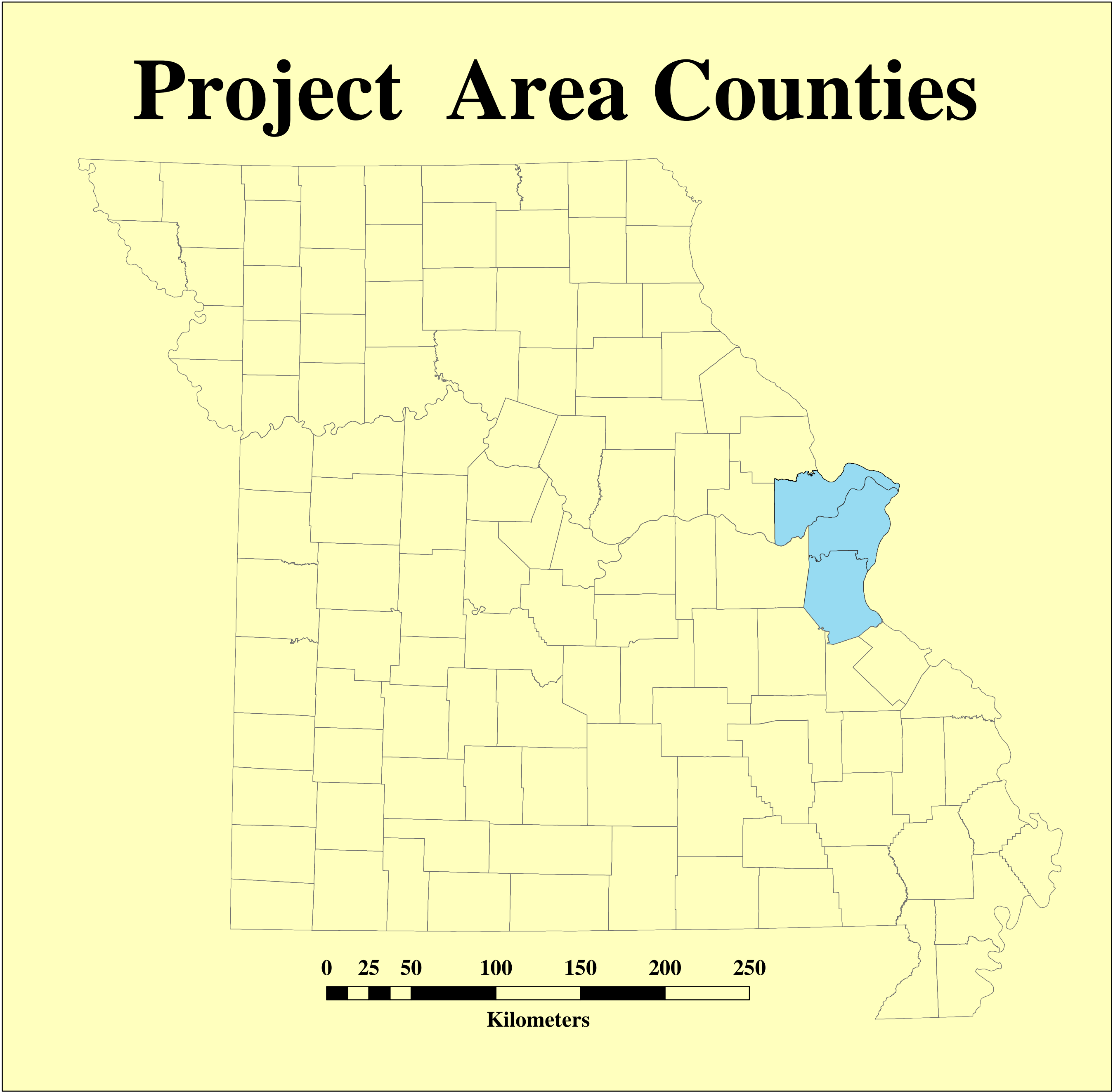
Type of strain dependent shear test:

Shear Modulus Data						Damping Data			
% strain 1	<input type="text" value="0.027900"/>	G1 (k/sf)	<input type="text" value="3802.78"/>	G1 (kN/sm)	<input type="text" value="181951.00"/>	% strain 1	<input type="text" value="0.258490"/>	D1	<input type="text" value="0.31"/>
% strain 2	<input type="text" value="0.049900"/>	G2 (k/sf)	<input type="text" value="2783.55"/>	G2 (kN/sm)	<input type="text" value="133184.00"/>	% strain 2	<input type="text" value="0.384810"/>	D2	<input type="text" value="0.39"/>
% strain 3	<input type="text" value="0.105000"/>	G3 (k/sf)	<input type="text" value="1679.57"/>	G3 (kN/sm)	<input type="text" value="80362.00"/>	% strain 3	<input type="text" value="0.511130"/>	D3	<input type="text" value="0.41"/>
% strain 4	<input type="text" value="0.270000"/>	G4 (k/sf)	<input type="text" value="918.81"/>	G4 (kN/sm)	<input type="text" value="43962.00"/>	% strain 4	<input type="text" value="0.637460"/>	D4	<input type="text" value="0.49"/>
% strain 5	<input type="text" value="0.390000"/>	G5 (k/sf)	<input type="text" value="665.06"/>	G5 (kN/sm)	<input type="text" value="31821.00"/>	% strain 5	<input type="text" value="1.584890"/>	D5	<input type="text" value="0.63"/>
% strain 6	<input type="text" value="0.545000"/>	G6 (k/sf)	<input type="text" value="583.15"/>	G6 (kN/sm)	<input type="text" value="27902.00"/>	% strain 6	<input type="text" value="0.000000"/>	D6	<input type="text" value="0.00"/>
% strain 7	<input type="text" value="1.090000"/>	G7 (k/sf)	<input type="text" value="230.42"/>	G7 (kN/sm)	<input type="text" value="11025.00"/>	% strain 7	<input type="text" value="0.000000"/>	D7	<input type="text" value="0.00"/>
% strain 8	<input type="text" value="0.000000"/>	G8 (k/sf)	<input type="text" value="0.00"/>	G8 (kN/sm)	<input type="text" value="0.00"/>	% strain 8	<input type="text" value="0.000000"/>	D8	<input type="text" value="0.00"/>
% strain 9	<input type="text" value="0.000000"/>	G9 (k/sf)	<input type="text" value="0.00"/>	G9 (kN/sm)	<input type="text" value="0.00"/>	% strain 9	<input type="text" value="0.000000"/>	D9	<input type="text" value="0.00"/>
% strain 10	<input type="text" value="0.000000"/>	G10 (k/sf)	<input type="text" value="0.00"/>	G10 (kN/sm)	<input type="text" value="0.00"/>	% strain 10	<input type="text" value="0.000000"/>	D10	<input type="text" value="0.00"/>

Record: 1 of 3

Identity of number system, English (E), Metric (M), automatically entered from structure table

Figure 1. St. Louis, Missouri Area Surficial Materials Database
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Project Area and Types of Data Available
St. Louis Urban Seismic Hazard
Mapping Project

The St. Louis Urban Seismic Hazard Project includes an area of 22 7.5-minute quadrangles in Missouri. The St. Louis urban area is one of two regions that are the focus of the USGS Earthquake Hazard Program, Five-Year Science Plan in the Central and Eastern United States. Data in this project are being collected for mapping purposes and to create a public accessible database.

Data collected for the project to date are from the Missouri Department of Transportation. The four figures below show the location and types of data collected.

